

WHAT IS CLAIMED IS:

1. A power semiconductor device comprising:
 - a semiconductor active layer;
 - a first base layer of a first conductivity type
 - 5 disposed in the active layer;
 - a plurality of trenches disposed in a surface of the active layer at intervals to partition a main cell and a dummy cell, and to reach the first base layer;
 - a collector layer of a second conductivity type
 - 10 disposed on the first base layer, at a position remote from the trenches;
 - a second base layer of the second conductivity type disposed in the main cell and on the first base layer;
 - 15 an emitter layer of the first conductivity type disposed on the second base layer;
 - a buffer layer of the second conductivity type disposed in the dummy cell and on the first base layer;
 - a gate electrode disposed in each trench to face,
 - 20 through a gate insulating film, a portion of the second base layer sandwiched between the first base layer and the emitter layer;
 - a collector electrode disposed on the collector layer;
 - 25 an emitter electrode disposed on the second base layer and the emitter layer; and
 - a partition structure disposed in the surface of

the active layer to electrically isolate the buffer layer from the emitter electrode.

2. The device according to claim 1, wherein the partition structure comprises a partition wall formed of a partition trench disposed in the surface of the active layer.

3. The device according to claim 2, wherein the partition trench has a depth substantially the same as the trenches.

4. The device according to claim 2, further comprising a conductive layer disposed in the partition trench and wrapped in an insulating film, wherein the conductive layer is electrically connected to the gate electrode.

5. The device according to claim 2, wherein the partition trench is filled with an insulating layer.

6. The device according to claim 1, wherein the partition structure comprises a partition wall formed of a partition layer of the first conductivity type disposed in the surface of the active layer.

7. The device according to claim 6, wherein the partition layer comprises a portion integral with the first base layer.

8. The device according to claim 1, wherein the partition structure comprises a partition wall formed of a combination of a partition trench and a partition layer of the first conductivity type, the partition

trench being disposed in the surface of the active layer, and the partition layer of the first conductivity type being disposed in the active layer at a position deeper than the partition trench.

5 9. The device according to claim 1, wherein the partition structure comprises dummy cell end walls, which bridge ends of the trenches one on either end of the dummy cell and cooperate with the trenches to surround the dummy cell.

10 10. The device according to claim 1, wherein the partition structure comprises main cell end walls, which bridge ends of the trenches one on either end of the main cell and cooperate with the trenches to surround the main cell.

15 11. A power semiconductor device including an active region and a junction termination region surrounding the active region, comprising:

 a semiconductor active layer common to the active region and the junction termination region, the active
20 layer having first and second main surfaces on opposite sides;

 a first base layer of a first conductivity type disposed in the active layer over the active region and the junction termination region;

25 a plurality of trenches disposed within the active region and in the first main surface of the active layer at intervals to partition a main cell and a dummy

cell, and to reach the first base layer;

5 a collector layer of a second conductivity type disposed within the active region and on the first base layer on the second main surface side of the active layer;

a second base layer of the second conductivity type disposed in the main cell and on the first base layer;

10 an emitter layer of the first conductivity type disposed on the second base layer;

a buffer layer of the second conductivity type disposed in the dummy cell and on the first base layer;

15 a gate electrode disposed in each trench to face, through a gate insulating film, a portion of the second base layer sandwiched between the first base layer and the emitter layer;

a collector electrode disposed on the collector layer;

20 an emitter electrode disposed on the second base layer and the emitter layer;

a guard ring layer of the second conductivity type disposed at a boundary portion between the active region and the junction termination region to surround the active region, the guard ring layer being formed in the first main surface of the active layer and electrically connected to the emitter electrode; and

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a partition structure disposed in the first main

surface of the active layer to electrically isolate the buffer layer from the emitter electrode, wherein the partition structure includes a first isolating section that intervenes between the p-buffer layer and the second base layer to electrically isolate them from each other, and a second isolating section that intervenes between the p-buffer layer and the guard ring layer to electrically isolate them from each other.

10 12. The device according to claim 11, wherein the partition structure comprises a partition wall formed of a partition trench disposed in the first main surface of the active layer, as the first isolating section or the second isolating section.

15 13. The device according to claim 11, wherein the partition structure comprises a partition wall formed of a partition layer of the first conductivity type disposed in the first main surface of the active layer, as the first isolating section or the second isolating section.

20 14. The device according to claim 11, wherein the partition structure comprises a partition wall formed of a combination of a partition trench and a partition layer of the first conductivity type, as the first isolating section or the second isolating section, the partition trench being disposed in the first main surface of the active layer, and the partition layer of

the first conductivity type being disposed in the active layer at a position deeper than the partition trench.

15 15. The device according to claim 11, wherein the first and second isolating sections comprise a common wall formed of dummy cell end walls, which bridge ends of the trenches one on either end of the dummy cell and cooperate with the trenches to surround the dummy cell.

10 16. The device according to claim 11, wherein the first isolating section comprises main cell end walls, which bridge ends of the trenches one on either end of the main cell and cooperate with the trenches to surround the main cell.

15 17. The device according to claim 11, wherein the second isolating section comprises a surrounding wall disposed in the first main surface of the active layer to surround the main cell and the dummy cell.

20 18. The device according to claim 11, wherein the buffer layer and the guard ring layer are deeper than the trenches.

25 19. The device according to claim 18, wherein the first and second isolating sections comprise a common wall that cooperates with the trenches to surround the dummy cell, wherein the common wall comprises partition trenches that bridge ends of the trenches one on either end of the dummy cell and cooperate with the trenches to surround the dummy cell, and a surrounding layer of

the first conductivity type disposed in the active layer along the trenches and the partition trenches, such that the trenches, the partition trenches, and the surrounding layer are combined with each other to form a surrounding wall to surround the main cell and the dummy cell.

20. The device according to claim 18, wherein the second isolating section comprises a surrounding wall disposed in the first main surface of the active layer to surround the main cell and the dummy cell, wherein the surrounding wall comprises a combination of a surrounding trench disposed in the first main surface of the active layer, and a surrounding layer of the first conductivity type disposed in the active layer at a position deeper than the surrounding trench.